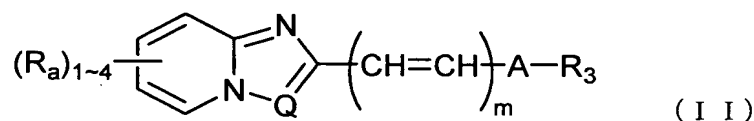
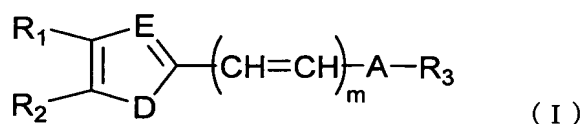


# CLAIMS

1. A compound, which is used as a probe for diagnosing diseases in which prion protein is accumulated, represented by the formula (I) or (II):



wherein D is NR', S, O, CH=CH, or CH<sub>2</sub>,

R' is H, alkyl having 1 to 4 carbons (hereinafter, referred to as C<sub>1-4</sub> alkyl), or phenyl, wherein the C<sub>1-4</sub> alkyl is optionally substituted with halogen(s),

E is N or CH,

R<sub>a</sub> is, each independently, selected from the group consisting of H, C<sub>1-4</sub> alkyl, halogen, OH, C<sub>1-4</sub> alkyl-OH, C<sub>1-4</sub> alkyl-O-C<sub>1-4</sub> alkyl, NH<sub>2</sub>, NH(C<sub>1-4</sub> alkyl), N(C<sub>1-4</sub> alkyl)<sub>2</sub>, NO<sub>2</sub>, O-C<sub>1-4</sub> alkyl, COOH, and SO<sub>3</sub>H, wherein the C<sub>1-4</sub> alkyl is optionally substituted with halogen(s),

Q is N or CR<sub>b</sub>,

R<sub>b</sub> is selected from the group consisting of H, C<sub>1-4</sub> alkyl, halogen, OH, C<sub>1-4</sub> alkyl-OH, C<sub>1-4</sub> alkyl-O-C<sub>1-4</sub> alkyl, NH(C<sub>1-4</sub> alkyl), NH<sub>2</sub>, N(C<sub>1-4</sub> alkyl)<sub>2</sub>, NO<sub>2</sub>, O-C<sub>1-4</sub> alkyl, COOH, and SO<sub>3</sub>H, wherein the

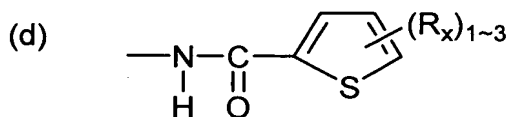
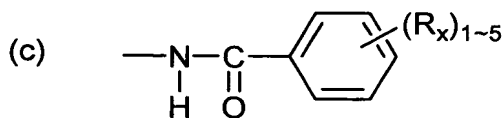
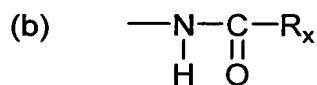
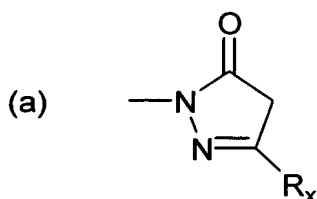
C<sub>1-4</sub> alkyl is optionally substituted with halogen(s),

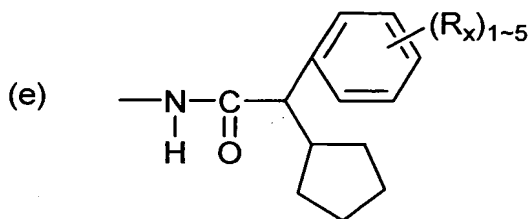
m is an integer of 0 to 4,

R<sub>1</sub> and R<sub>2</sub> are independently selected from the group consisting of H, C<sub>1-4</sub> alkyl, halogen, OH, C<sub>1-4</sub> alkyl-OH, C<sub>1-4</sub> alkyl-O-C<sub>1-4</sub> alkyl, NH(C<sub>1-4</sub> alkyl), NH<sub>2</sub>, N(C<sub>1-4</sub> alkyl)<sub>2</sub>, NO<sub>2</sub>, O-C<sub>1-4</sub> alkyl, COOH, and SO<sub>3</sub>H, wherein the C<sub>1-4</sub> alkyl is optionally substituted with halogen(s),

or alternatively, R<sub>1</sub> and R<sub>2</sub>, together, form a benzene or naphthalene ring which is optionally substituted with one to four R<sub>4</sub>,

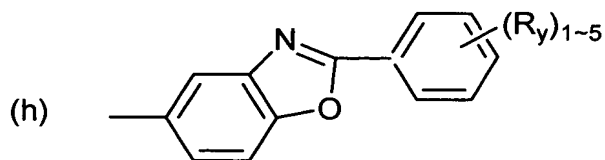
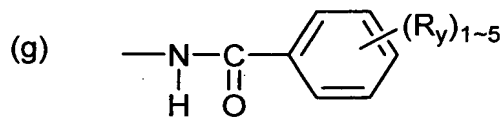
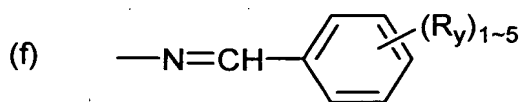
R<sub>3</sub> is selected from the group consisting of H, C<sub>1-4</sub> alkyl, halogen, OH, C<sub>1-4</sub> alkyl-OH, C<sub>1-4</sub> alkyl-O-C<sub>1-4</sub> alkyl, NH<sub>2</sub>, NH(C<sub>1-4</sub> alkyl), N(C<sub>1-4</sub> alkyl)<sub>2</sub>, NO<sub>2</sub>, O-C<sub>1-4</sub> alkyl, COOH, SO<sub>3</sub>H, wherein the C<sub>1-4</sub> alkyl is optionally substituted with halogen(s), and any one of the moieties represented by (a) to (e):

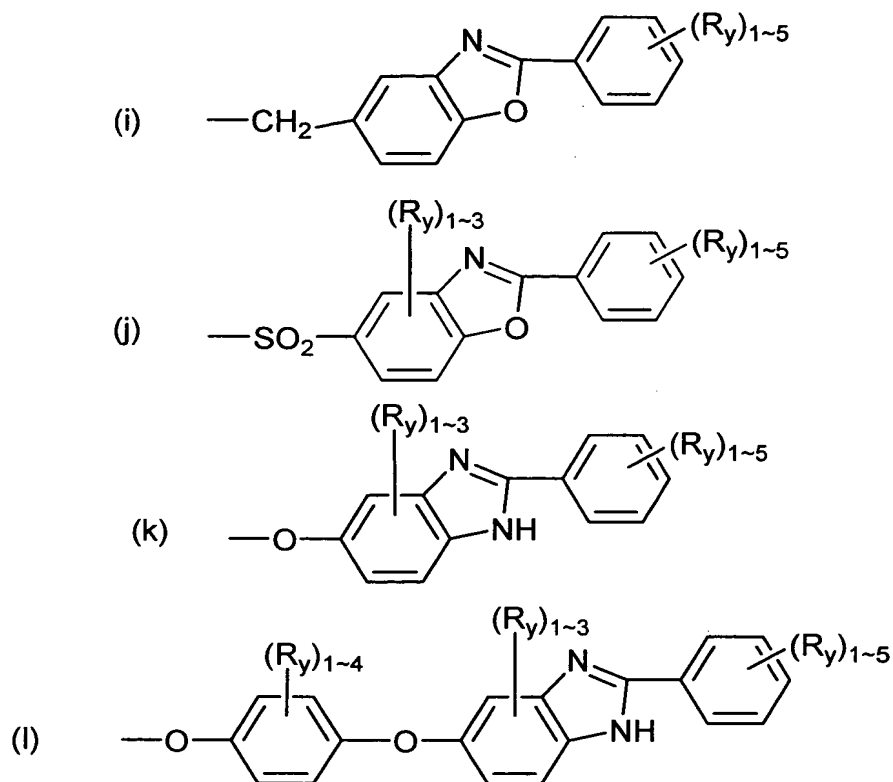




wherein each  $R_x$  is independently selected from the group consisting of H,  $C_{1-4}$  alkyl, halogen, OH,  $C_{1-4}$  alkyl-OH,  $C_{1-4}$  alkyl-O- $C_{1-4}$  alkyl,  $NH_2$ ,  $NH(C_{1-4}$  alkyl),  $N(C_{1-4}$  alkyl) $_2$ ,  $N=CH$ -allyl,  $NO_2$ , O- $C_{1-4}$  alkyl,  $COOH$ , and  $SO_3H$ , wherein the  $C_{1-4}$  alkyl is optionally substituted with halogen(s),

each  $R_4$  is independently selected from the group consisting of H,  $C_{1-4}$  alkyl, halogen, OH,  $C_{1-4}$  alkyl-OH,  $C_{1-4}$  alkyl-O- $C_{1-4}$  alkyl,  $NH_2$ ,  $NH(C_{1-4}$  alkyl),  $N(C_{1-4}$  alkyl) $_2$ ,  $NO_2$ , O- $C_{1-4}$  alkyl,  $COOH$ ,  $SO_3H$ , wherein the  $C_{1-4}$  alkyl is optionally substituted with halogen(s), and any one of the moieties represented by (f) to (l):

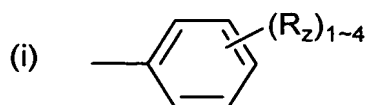


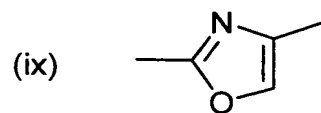
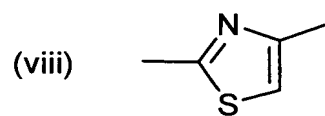
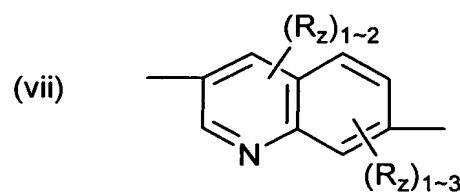
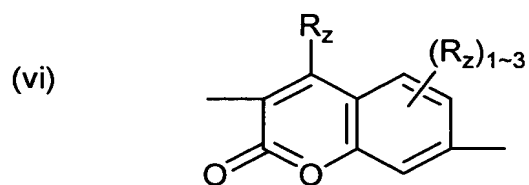
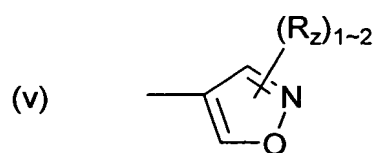
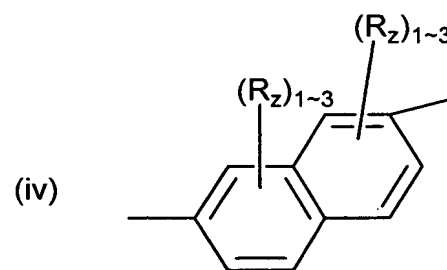
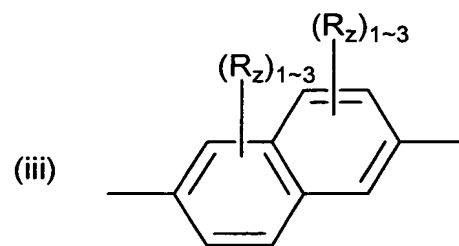
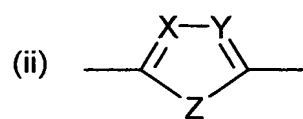


wherein two  $R_4$ s attached on adjacent carbons may form a methylenedioxy group, and wherein the  $C_{1-4}$  alkyl is optionally substituted with halogen(s),

each  $R_y$  is independently selected from the group consisting of H,  $C_{1-4}$  alkyl, halogen, OH,  $C_{1-4}$  alkyl-OH,  $C_{1-4}$  alkyl-O- $C_{1-4}$  alkyl,  $NH_2$ ,  $NH(C_{1-4}$  alkyl),  $N(C_{1-4}$  alkyl) $_2$ ,  $NO_2$ , O- $C_{1-4}$  alkyl,  $COOH$ , and  $SO_3H$ , wherein the  $C_{1-4}$  alkyl is optionally substituted with halogen(s),

A is any one of the rings represented by (i) to (ix):





wherein each  $R_z$  is independently selected from the group consisting of H,  $C_{1-4}$  alkyl, halogen, OH,  $C_{1-4}$  alkyl-OH,  $C_{1-4}$  alkyl -O- $C_{1-4}$  alkyl,  $NH_2$ ,  $NH(C_{1-4} \text{ alkyl})$ ,  $N(C_{1-4} \text{ alkyl})_2$ ,  $NO_2$ , O- $C_{1-4}$  alkyl, phenyl,  $COOH$ , and  $SO_3H$ , wherein the  $C_{1-4}$  alkyl is optionally substituted with halogen(s),

X is N or CH,

Y is N or CH,

Z is O, S,  $CH_2$ ,  $N-C_pH_{2p+1}$ , and

p is an integer of 0 to 4,

or a salt or solvate thereof.

2. The compound according to claim 1, wherein the compound is selected from the group consisting of BF-124, BF-125, BF-126, BF-133, BF-136, BF-142, BF-143, BF-147, BF-148, BF-150, BF-151, BF-154, BF-160, BF-162, BF-165, BF-168, BF-172, BF-180, BF-191, BF-192, BF-196, BF-197, BF-198, BF-200, BF-201, BF-203, BF-206, BF-208, BF-225, BF-227, BF-228, N-227, N-228, N-276, N-282, N-283, and N-407.

3. The compound according to claim 1, wherein the compound is selected from the group consisting of BF-124, BF-148, BF-165, BF-168, BF-191, BF-192, BF-196, BF-197, BF-198, BF-200, BF-201, BF-203, BF-206, BF-208, BF-227, BF-228, N-276, N-277, and N-313.

4. The compound according to any one of claims 1 to 3, wherein

the compound is labeled, or a salt or solvate thereof.

5. The compound according to any one of claims 1 to 3, wherein the compound is labeled with a radionuclide, or a salt or solvate thereof.

6. The compound according to any one of claims 1 to 3, wherein the compound is labeled with a  $\gamma$ -ray emitting nuclide, or a salt or solvate thereof.

7. The compound according to any one of claims 1 to 3, wherein the compound is labeled with a  $\gamma$ -ray emitting nuclide selected from the group consisting of  $^{99m}\text{Tc}$ ,  $^{111}\text{In}$ ,  $^{67}\text{Ga}$ ,  $^{201}\text{Tl}$ ,  $^{123}\text{I}$ , and  $^{133}\text{Xe}$ , or a salt or solvate thereof.

8. The compound according to any one of claims 1 to 3, wherein the compound is labeled with a  $\gamma$ -ray emitting nuclide selected from the group consisting of  $^{99m}\text{Tc}$  and  $^{123}\text{I}$ , or a salt or solvate thereof.

9. The compound according to any one of claims 1 to 3, wherein the compound is labeled with a positron emitting nuclide, or a salt or solvate thereof.

10. The compound according to any one of claims 1 to 3, wherein

the compound is labeled with a positron emitting nuclide selected from the group consisting of  $^{11}\text{C}$ ,  $^{13}\text{N}$ ,  $^{15}\text{O}$ , and  $^{18}\text{F}$ , or a salt or solvate thereof.

11. The compound according to any one of claims 1 to 3, wherein the compound is labeled with  $^{18}\text{F}$ , or a salt or solvate thereof.

12. A composition for the diagnosis of diseases in which prion protein is accumulated, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof and a pharmaceutically acceptable carrier.

13. A kit for the diagnosis of diseases in which prion protein is accumulated, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof as the essential ingredient.

14. A method for the diagnosis of diseases in which prion protein is accumulated, which comprises employing a compound according to any one of claims 1 to 11, or a salt or solvate thereof.

15. The composition according to claim 12, the kit according to claim 13, or the method according to claim 14, wherein the compound is a compound according to claim 2.

16. A composition for the imaging diagnosis of diseases in



which prion protein is accumulated, comprising a compound according to any one of claims 5 to 11, or a pharmaceutically acceptable salt or solvate thereof, and a pharmaceutically acceptable carrier.

17. The composition according to claim 16, comprising a compound according to claim 8, or a pharmaceutically acceptable salt or solvate thereof.

18. The composition according to claim 16, comprising a compound according to claim 11, or a pharmaceutically acceptable salt or solvate thereof.

19. A kit for the imaging diagnosis of diseases in which prion protein is accumulated, comprising a compound according to any one of claims 5 to 11, or a pharmaceutically acceptable salt or solvate thereof as the essential ingredient.

20. The kit according to claim 19, comprising a compound according to claim 8, or a pharmaceutically acceptable salt or solvate thereof as the essential ingredient.

21. The kit according to claim 19, comprising a compound according to claim 11, or a pharmaceutically acceptable salt or solvate thereof as the essential ingredient.

22. A method for the imaging diagnosis of diseases in which prion protein is accumulated, which comprises employing a compound according to any one of claims 5 to 11, or a pharmaceutically acceptable salt or solvate thereof.

23. The composition according to any one of claims 16 to 18, the kit according to any one of claims 19 to 21, or the method according to claim 22, wherein the compound is a compound according to claim 3 labeled with a  $\gamma$ -ray or positron emitting nuclide, and the imaging diagnosis is carried out by PET or SPECT.

24. A composition for staining abnormal prion protein in samples, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof.

25. A kit for staining abnormal prion protein in samples, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof as the essential ingredient.

26. A method for staining abnormal prion protein in samples, which comprises employing a compound according to any one of claims 1 to 11, or a salt or solvate thereof.

27. The composition according to claim 24, the kit according to claim 25, or the method according to claim 26, wherein the compound

is a compound according to claim 2.

28. A composition for the in vitro diagnosis of an individual with a disease having accumulated prion protein in the living body, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof.

29. A kit for the in vitro diagnosis of an individual with a disease having accumulated prion protein in the living body, comprising a compound according to any one of claims 1 to 11, or a salt or solvate thereof as the essential ingredient.

30. A method for the in vitro diagnosis of an individual with a disease having accumulated prion protein in the living body, which comprises obtaining samples from a subject animal, and contacting to said samples a compound according to any one of claims 1 to 11, or a salt or solvate thereof.

31. The composition according to claim 28, the kit according to claim 29, or the method according to claim 30, wherein the compound is selected from the group consisting of BF-168, BF-191, BF-192, BF-196, BF-197, BF-198, BF-200, BF-201, BF-203, BF-206, BF-208, BF-227, BF-228, and N-278.

32. A pharmaceutical composition for the prophylaxis and/or

treatment of a disease in which the accumulation of prion protein in the body constitutes or partially constitutes the etiology, comprising a compound according to claim 1, or a pharmaceutically acceptable salt or solvate thereof and a pharmaceutically acceptable carrier.

33. The pharmaceutical composition according to claim 32, wherein the disease is selected from the group consisting of transmissible spongiform encephalopathy and prion diseases.

34. A method for the treatment of a disease in which the accumulation of prion protein in the body constitutes or partially constitutes the etiology, which comprises administering a compound according to claim 1, or a pharmaceutically acceptable salt or solvate thereof.

35. The method according to claim 34, wherein the disease is selected from the group consisting of transmissible spongiform encephalopathy and prion diseases.

36. Use of a compound according to claim 1, or a pharmaceutically acceptable salt or solvate thereof for prophylaxis and/or treatment of a disease in which the accumulation of prion protein in the body constitutes or partially constitutes the etiology.

37. The use according to claim 36, wherein the disease is selected from the group consisting of transmissible spongiform encephalopathy and prion diseases.

38. Use of a compound of the present invention for manufacturing a medicament for the prophylaxis and/or treatment of a disease in which the accumulation of prion protein in the body constitutes or partially constitutes the etiology.

39. The use according to claim 38, wherein the disease is selected from the group consisting of transmissible spongiform encephalopathy and prion diseases.

40. The composition according to claim 32 or 33, the kit according to claim 34 or 35, the method according to claim 36 or 37, or the method according to claim 38 or 39, wherein the compound is selected from the group consisting of BF-130, F-135, BF-136, BF-141, BF-146, BF-148, BF-150, BF-153, BF-168, N-220, N-221, N-223, N-224, N-232, N-243, N-246, N-407, N-437, N-441, N-453, N-457, BF-192, BF-193, BF-198, BF-199, BF-201, BF-203, BF-204, BF-206, BF-208, BF-211, BF-213, BF-227, and BF-231.

41. The composition according to claim 32 or 33, the kit according to claim 34 or 35, the method according to claim 36 or

37, or the method according to claim 38 or 39, wherein the compound is selected from the group consisting of BF-130, BF-135, BF-146, N-407, N-437, N-441, N-453, N-457, BF-208, BF-227, BF-231, BF-192, BF-193, BF-198, BF-199, BF-201, BF-203, BF-204, BF-206, BF-208, BF-211, BF-213, N-220, N-221, N-223, and N-224.

42. A labeled precursor of a compound according to claim 1.

43. A labeled precursor of BF-168, BF-224, or N-227, wherein the precursor is a tosylate derivative.